is therefore intended that the scope of the present invention include and comprise compositions adapted to meet the nutritional requirements of any such lactating ruminant. This is so regardless of the fact that the majority of the following description discusses the invention in terms of particular formulations for and the benefits of feeding these formulations to dairy cows.

[0014] The present invention concerns the use of a high quality inedible egg product as a significant source of protein and other beneficial nutrients in a diet for lactating ruminants. Therefore, one aspect of the present invention concerns a method of manufacturing a high quality inedible egg product. The term "high quality inedible egg product" as used in the present disclosure refers to inedible eggs ("inedible eggs" defined below) that have been prepared according to a manufacturing method disclosed and taught as an aspect of the present invention. According to other aspects of the present invention, there are provided feedstuff compositions and diet programs for lactating ruminants that may be adapted to various stages of lactation.

[0015] The high quality inedible egg product that forms the basis of all the preferred diet compositions of the present invention begins with "inedible" eggs. Inedible eggs are defined to include those whole raw eggs, hard boiled eggs, egg yolks, egg albumen, and all other liquid or dry egg fractions that the United States Department of Agriculture ("USDA") has mandated cannot be used in human feeds or for human consumption. Often the eggs that become inedible eggs are cracked, dirty, or misshapen. The term "inedible egg product" as used with this invention broadly encompasses any and all types of inedible eggs to which a dye has been added in conformance with USDA requirements.

[0016] The high quality of the inedible egg products contemplated for use with the present invention is obtained by employing the following method. Eggs destined to become inedible eggs are obtained, the shells broken, and a denaturant dye added to clearly show that the product is not for human consumption. Those of skill in the art will recognize those classes of compounds that may be used as the denaturant dye without affecting the nutritional analysis or makeup of the inedible egg. Next, the eggshells are removed by centrifuging the liquid egg through a filter, or by any other method known or contemplated for accomplishing the removal of shell debris from liquid egg.

[0017] The liquid egg obtained thereby is then held in refrigerated storage tanks at a temperature of about 45° F. or less until it can be delivered to the heat-pasteurizing unit, but preferably for not longer than about five days. Once the liquid egg is in the pasteurizer, it is heated to a temperature of at least 140° F. and held at that temperature for at least 4.5 minutes in order to kill all pathogenic and spoilage-inducing microorganisms. Again, those of skill in the art will recognize that the removal and/or growth inhibition of pathogenic and spoilage-inducing microorganisms may be accomplished by methods other than heat treatment, and such methods are intended and contemplated to come within the meaning of the term "pasteurizing" as it is used with the present invention.

[0018] At this point in the present manufacturing method, the manufacturer decides whether the inedible egg product will remain liquid or will be dried to produce a powder. If it is to remain liquid, the egg product is either packaged immediately and refrigerated or frozen or returned to a refrigerated storage tank until it can be packaged in an airtight and watertight container and then refrigerated or frozen. If it is to become a dry inedible egg product, then the inedible egg product is either spray dried immediately or returned to a refrigerated storage tank until it can be spray dried.

[0019] The inedible egg product may then be spray dried without any additives according to those procedures known in the art of spray drying. Upon completion of the spray drying process, a free-flow or anti-caking agent may be added to the inedible egg product to prevent the formation of hard lumps in storage. Preferably, the moisture level of the resultant dry inedible egg product is between about 2 and about 10 percent. More preferably, the moisture level of the resultant dry inedible egg product is between about 3 and about 7 percent; and most preferably, the moisture level of the resultant dry inedible egg product is between about 4 and about 6 percent.

[0020] Those of skill in the art will recognize that the use of a spray dryer is particularly desirable in that it minimizes damage to the proteins contained in the inedible egg product and therefore yields a very high quality inedible egg product. This dry inedible egg product is shelf-stable and may be packaged in airtight and watertight containers for shipment and sale, without requiring refrigeration or freezing for storage.

[0021] In the most preferred embodiments of this invention, whole inedible eggs are used to manufacture the high quality inedible egg product in order to obtain the full nutritional and flavor values possessed by whole eggs. The present high quality inedible egg product may be provided in a liquid or a dried form. The liquid form is preferably refrigerated during storage, although those of skill in the art will recognize that room temperature storage may be accomplished by methods known in the art such as chemical preservation and/or canning. Also, the liquid form may be blended with other preferred ingredients for convenience in storage, preparation, and feeding. The dried form does not require refrigeration during dry storage. The dried form may be reconstituted with water or other suitable liquid ingredients to form a liquid supplement according to the present invention, and it may also be dry blended with other preferred ingredients for convenience in storage, preparation, and feeding of a complete feed according to the present invention.

[0022] A preferred feed supplement embodiment of the present invention comprises the high quality inedible egg product in an amount from about 1% to 100% by weight of the composition. A preferred concentrate feed embodiment of the present invention comprises the high quality inedible egg product in an amount from about 1% to 100% by weight of the composition. The high quality inedible egg ingredient is typically present in the feed in the range of about 25% to 100% by weight, and more preferably from about 36% to about 65% by weight.

[0023] The balance of the present inventive feed supplement and concentrate feed compositions, when those compositions comprise less than 100% high quality inedible egg product, may consist of any desired ingredients in any desired combination capable of supplying the nutritional requirements of a lactating ruminant animal, including, but